



Serial No.: 09/508,874

Confirmation No.: 3542

Applicant: MAITLAND, Geoffrey et al.

Atty. Ref.: 11836.0689.PCUS00

AMENDMENTS TO THE CLAIMS:

Please amend the claims as follows:

1-22. Canceled

23. (Currently Amended) A wellbore fluid as in claim 22 39, wherein the non-aqueous liquid phase further comprises a water immiscible organic liquid OL.

24. (Previously presented) A wellbore fluid as in claim 23, wherein the non-aqueous liquid phase is comprised of 1 to 99% by volume of POL + 99 to 1% by volume OL, and more preferably of 5 to 95% by volume of POL and 95 to 5% by volume of OL.

25. (Currently Amended) ~~A wellbore fluid of the water-in-oil emulsion type comprising a discontinuous aqueous or brine phase, solids, a water immiscible organic liquid OL, and having a non-aqueous continuous liquid phase that comprises a polar organic liquid POL which exhibits a dielectric constant of at least about 5.0 and a Hildebrand Solubility Parameter of at least about $17 \text{ (J cm}^{-3})^{1/2}$ so that the liquid phase exhibits an electrical conductivity of not less than $10 \mu\text{S m}^{-1}$ at 1 kHz.~~ The wellbore fluid of claim 39, wherein the non-aqueous liquid phase further comprises a dissolved component (DC) selected from: water; inorganic salts wherein the anion(s) is (are) a conjugate base of an acid whose dissociation constant (pK_a) in water at 298 °K is less than about 1.0, and the cation is ammonium ion or a metal ion which has an ionic radius of less than about 2/3 of the ionic radius of the pre-selected anion; quaternary ammonium salts or hydroxides; N-alkyl pyridinium salts or hydroxides; and organic bases exhibiting a pK_a in water at 298 °K of more than 10.0, and their salts.

26. (Original) A wellbore fluid as in claim 25, wherein the non-aqueous liquid phase comprises of about 0.1 % to about 50% by volume of the dissolved component DC.

27. (Original) A wellbore fluid as in claim 26, wherein the non-aqueous liquid phase comprises 1 to 98.5% by volume POL , 1 to 98.5% by volume OL and 0.5 to 50% by volume DC.



Serial No.: 09/508,874

Confirmation No.: 3542

Applicant: MAITLAND, Geoffrey et al.

Atty. Ref.: 11836.0689.PCUS00

28. (Previously presented) A wellbore fluid as in claim 25 wherein the polar organic liquid POL is one or more selected from the group consisting of alcohols, phenols, glycols, polyalkylene glycols, mono alkyl or mono aryl ethers of glycols, mono alkyl or mono aryl ethers of polyalkylene glycols, monoalkanoate esters of glycols, monoalkanoate esters of polyalkylene glycols, ketones possessing also hydroxyl group(s), diketones.

29. (Previously presented) A wellbore fluid as in claim 25, wherein the polar organic liquid POL component is selected from the group consisting of:

- aliphatic and alicyclic alcohols of carbon numbers C_3 - C_{10} ;
- phenols;
- glycols;
- polyalkylene glycols;
- mono-alkyl or mono-aryl ethers of glycols or polyalkylene glycols;
- diacetone alcohol (4-hydroxy-4-methyl-1,2-pentanone); acetylacetone; acetonylacetone.

30. (Previously presented) A wellbore fluid as in claim 25, wherein the polar organic liquid POL is an aprotic solvent.

31. (Previously presented) A wellbore fluid as in claim 25 wherein the inorganic salt comprises anions which are the conjugate base of an acid selected from the group consisting of hydrochloric acid; hydrobromic acid; hydroiodic acid; thiocyanic acid; perchloric acid; nitric acid; permanganic acid; sulphuric acid; alkane sulphonic acids; arene sulphonic acids; alkylaryl sulphonic acid; alkane and arene sulphonic acids substituted with electron-withdrawing groups.

32. (Original) A wellbore fluid as in Claim 25 wherein the quaternary ammonium salts or hydroxides are the chlorides, bromides, iodides, methosulphates, ethosulphates or hydroxides of quaternary ammonium cations having alkyl and/or aryl and/or alkylaryl groups such that the total



Serial No.: 09/508,874

Confirmation No.: 3542

Applicant: MAITLAND, Geoffrey et al.

Atty. Ref.: 11836.0689.PCUS00

number of carbon atoms in all the groups combined with the nitrogen atom is in the range 8 to 60, and more preferably in the range 12 to 40.

33. (Previously presented) A wellbore fluid as in Claim 25 wherein the organic base(s) exhibiting a pK_a in water of more than 10.0 is selected from the group consisting of mono-, di-, and tri-alkylamines wherein the alkyl groups contain from 2 to 18 carbon atoms; alkylpiperidines; alkylpyrrolidines; N-alkylated ethyleneamines; and their salts.

34. Canceled

35. Canceled

36. Canceled

37. (Previously presented) A wellbore fluid as in claim 25 wherein a discontinuous liquid phase is added together with one or more emulsifier to form a water-in-organic-liquid emulsion wherein the discontinuous phase is present at up to 70% by volume of the emulsion.

38. Canceled

39. (Currently Amended) A wellbore fluid ~~as in Claim 38~~ of the water-in-oil emulsion type useful for electrical well-logging comprising a discontinuous aqueous or brine phase, solids, and having a non-aqueous continuous liquid phase that comprises a polar organic liquid POL which exhibits a dielectric constant of at least about 5.0 and a Hildebrand Solubility Parameter of at least about $17 \text{ (J cm}^{-3})^{1/2}$ so that the liquid phase exhibits an electrical conductivity of not less than $10 \mu\text{S m}^{-1}$ at 1 kHz, and wherein it further comprises a dispersion in the wellbore fluid of finely divided particles of an electrically conducting solid insoluble in the organic liquid or water, and wherein the finely divided electrically conducting solid is selected from the group consisting of metals; carbon preferably in the form of graphite or carbon fibre; metal coated carbon fibre or graphite; and conductive polymers and combinations thereof.

40. (Previously Presented) A wellbore fluid as in Claim 39 wherein the finely divided conducting solid is in the form of high aspect ratio fibres, flakes or platelets.



Serial No.: 09/508,874

Confirmation No.: 3542

Applicant: MAITLAND, Geoffrey et al.

Atty. Ref.: 11836.0689.PCUS00

41. Canceled.

42. Canceled.

43. Canceled.

44. (Currently Amended) A wellbore fluid as in claim 22 39 wherein the solids are further include clays or weighting materials or combinations thereof.

45. (Previously Presented) A wellbore fluid as in claim 29, wherein the aliphatic and alicyclic alcohols are selected from the group consisting of n-pentanol, cyclohexanol, n-octanol, 2-ethylhexanol, and n-decanol; the phenols are selected from the group consisting of ortho, meta, or para cresol; the polyalkylene glycols are selected from the group consisting of polypropylene glycols of molecular weight above about 1000, polybutylene glycols, polytetrahydrofuran, polyalkylene glycols or copolymers of ethylene oxide and/or propylene oxide and/or butylene oxide initiated by any hydroxylic or amino-functional moiety wherein the polyalkylene glycol or copolymer is further characterised by exhibiting a cloud point (at 1% concentration in water) of less than about 10 oC; the mono-alkyl or mono-aryl ethers of alcohols or polyalkylene glycols are selected from the group consisting of ethylene glycol monobutyl ether, diethylene glycol monobutyl ether, dipropylene glycol monomethyl ether, tripropylene glycol monomethyl ether, propylene glycol monobutyl ether, dipropylene glycol monobutyl ether, tripropylene glycol monobutyl ether, propylene glycol phenyl ether, dipropylene glycol phenyl ether.

46. Canceled

47. Canceled

48. Canceled

49. Canceled

50. (Previously Presented) A wellbore fluid as in Claim 37, wherein the discontinuous liquid phase is water or a brine.

51. (Previously Presented) A wellbore fluid as in Claim 39, wherein the conductive polymers are polyaniline, polypyrrole, and organometallic phthalocyanines.

52. Canceled



Serial No.: 09/508,874

Confirmation No.: 3542

Applicant: MAITLAND, Geoffrey et al.

Atty. Ref.: 11836.0689.PCUS00

53. Canceled

54. (Currently Amended) ~~A wellbore fluid as~~ The method in Claim 43 58, wherein the solids are clays or weighting materials.

55. (Currently Amended) The method in claim 43 58 wherein the polar organic liquid POL is one or more selected from the group consisting of alcohols, phenols, glycols, polyalkylene glycols, mono alkyl or mono aryl ethers of glycols, mono alkyl or mono aryl ethers of polyalkylene glycols, monoalkanoate esters of glycols, monoalkanoate esters of polyalkylene glycols, ketones possessing also hydroxyl group(s), diketones.

56. (Currently Amended) The method in claim 4358, wherein the polar organic liquid POL component is selected from the group consisting of:

- aliphatic and alicyclic alcohols of carbon numbers C₅-C₁₀;
- phenols;
- glycols;
- polyalkylene glycols;
- mono-alkyl or mono-aryl ethers of glycols or polyalkylene glycols;
- diacetone alcohol (4-hydroxy-4-methyl-1,2-pentanone); acetylacetone; acetonylacetone.

57. (Currently Amended) The method in claim 4358, wherein the polar organic liquid POL is an aprotic solvent.

58. (Previously Presented) ~~The method in claim 43~~ A method of providing enhanced information from electrical logging tools, measurement while drilling, logging while drilling, or geosteering wherein the efficiency is enhanced by the improved electrical conductivity of a water-in-oil type emulsion comprising a discontinuous aqueous or brine phase, solids and having a non-aqueous continuous liquid phase that comprises a polar organic liquid POL which exhibits



Serial No.: 09/508,874

Confirmation No.: 3542

Applicant: MAITLAND, Geoffrey et al.

Atty. Ref.: 11836.0689.PCUS00

a dielectric constant of at least about 5.0 and a Hildebrand Solubility Parameter of at least about $17 \text{ (J cm}^{-3})^{1/2}$ so that the liquid phase exhibits an electrical conductivity of not less than $10 \text{ } \mu\text{S m}^{-1}$ at 1 kHz, and wherein the non-aqueous liquid phase further comprises a dissolved component (DC) of inorganic salt comprising anions which are the conjugate base of an acid selected from the group consisting of hydrochloric acid; hydrobromic acid; hydroiodic acid; thiocyanic acid; perchloric acid; nitric acid; permanganic acid; sulphuric acid; alkane sulphonic acids; arene sulphonic acids; alkylaryl sulphonic acid; alkane and arene sulphonic acids substituted with electron-withdrawing groups.

59. (Previously Presented) ~~The method in claim 43~~ A method of providing enhanced information from electrical logging tools, measurement while drilling, logging while drilling, or geosteering wherein the efficiency is enhanced by the improved electrical conductivity of a water-in-oil type emulsion comprising a discontinuous aqueous or brine phase, solids and having a non-aqueous continuous liquid phase that comprises a polar organic liquid POL which exhibits a dielectric constant of at least about 5.0 and a Hildebrand Solubility Parameter of at least about $17 \text{ (J cm}^{-3})^{1/2}$ so that the liquid phase exhibits an electrical conductivity of not less than $10 \text{ } \mu\text{S m}^{-1}$ at 1 kHz and further comprising an organic base wherein the organic base(s) exhibits a pK_a in water of more than 10.0 and is selected from the group consisting of mono-, di-, and tri-alkylamines wherein the alkyl groups contain from 2 to 18 carbon atoms; alkylpiperidines; alkylpyrrolidines; N-alkylated ethyleneamines; and their salts.

60. Canceled